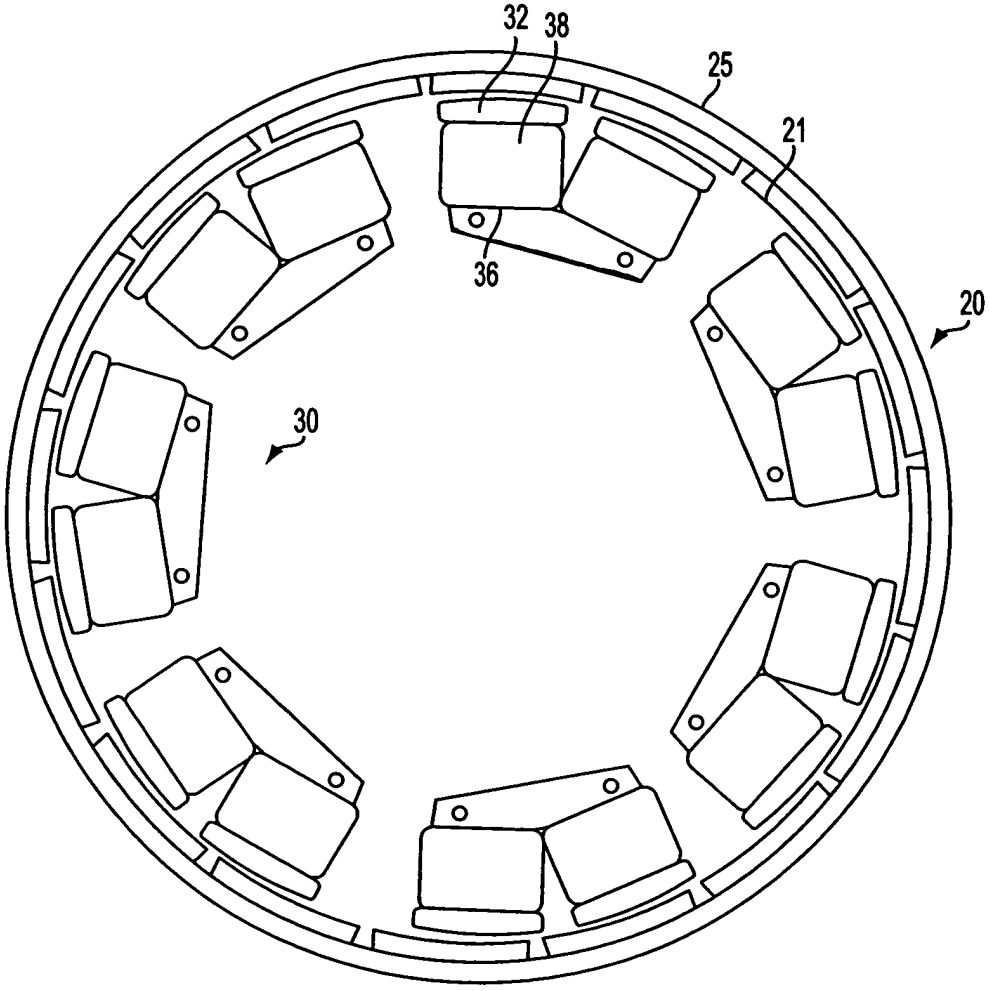

FIG. 1

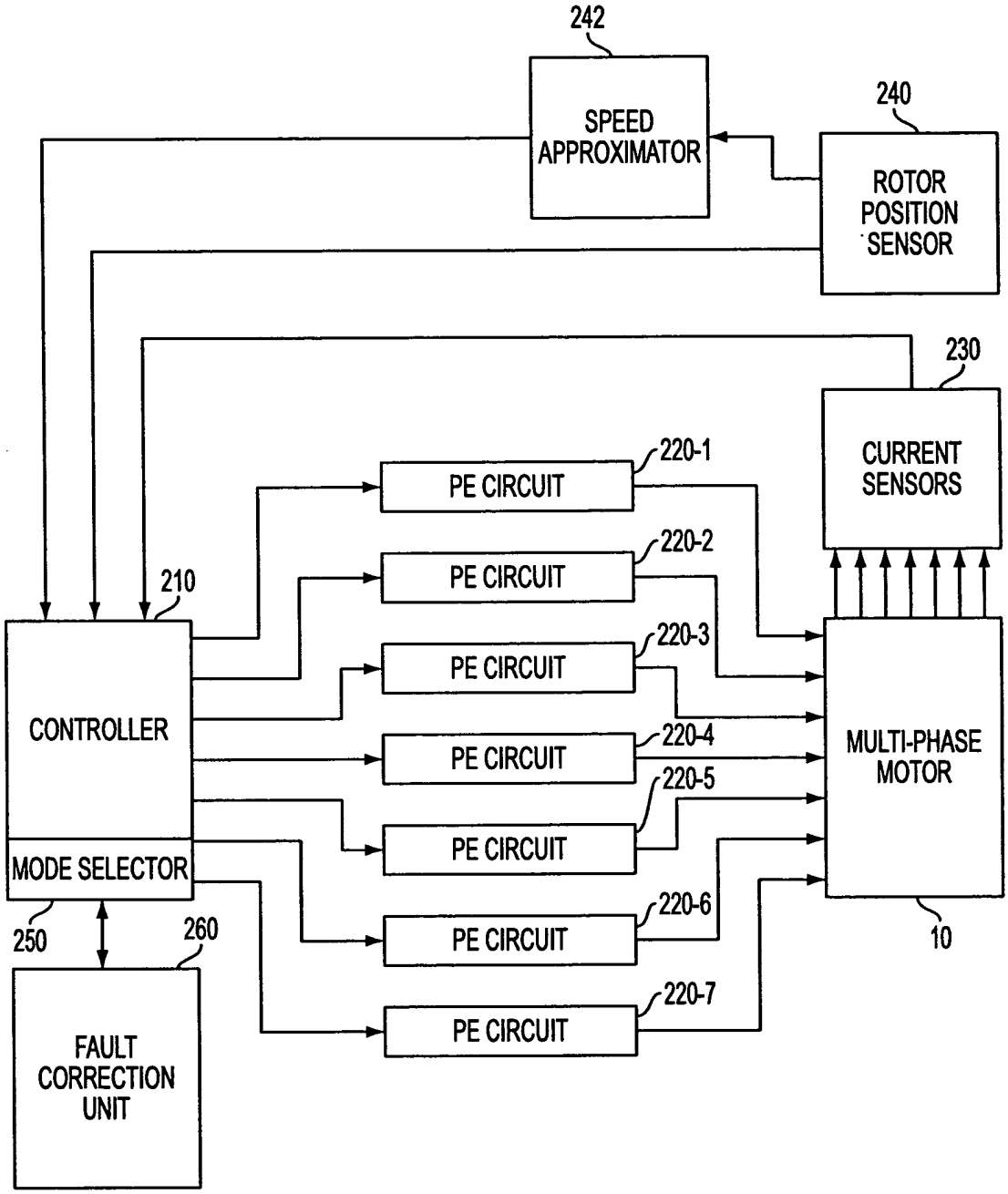
242
SPEED APPROXIMATOR
240
ROTOR POSITION SENSOR
230
CURRENT SENSORS
220-1
PE CIRCUIT
220-2
PE CIRCUIT
220-3
PE CIRCUIT
220-4
PE CIRCUIT
220-5
PE CIRCUIT
220-6
PE CIRCUIT
220-7
PE CIRCUIT
210
CONTROLLER
MODE SELECTOR
250
260
FAULT CORRECTION UNIT
MULTI-PHASE MOTOR
10

FIG. 2

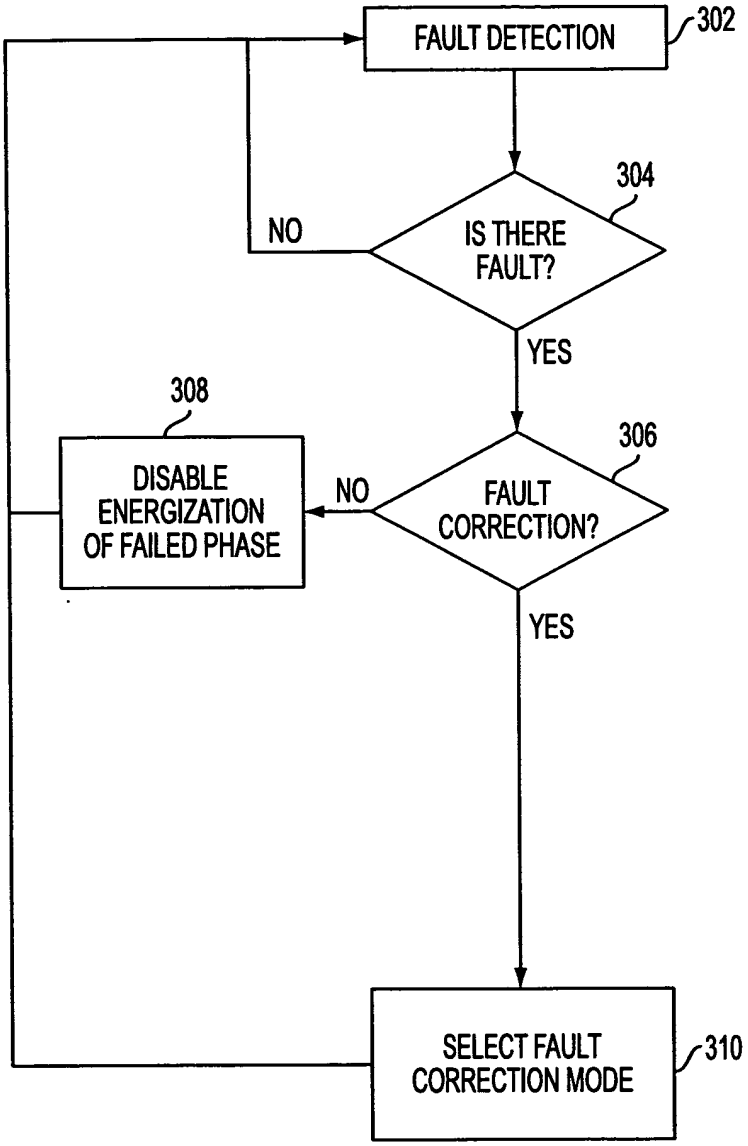
FAULT DETECTION
302
304
IS THERE FAULT?
NO
YES
308
DISABLE ENERGIZATION OF FAILED PHASE
306
FAULT CORRECTION?
NO
YES
SELECT FAULT CORRECTION MODE
310

FIG. 3

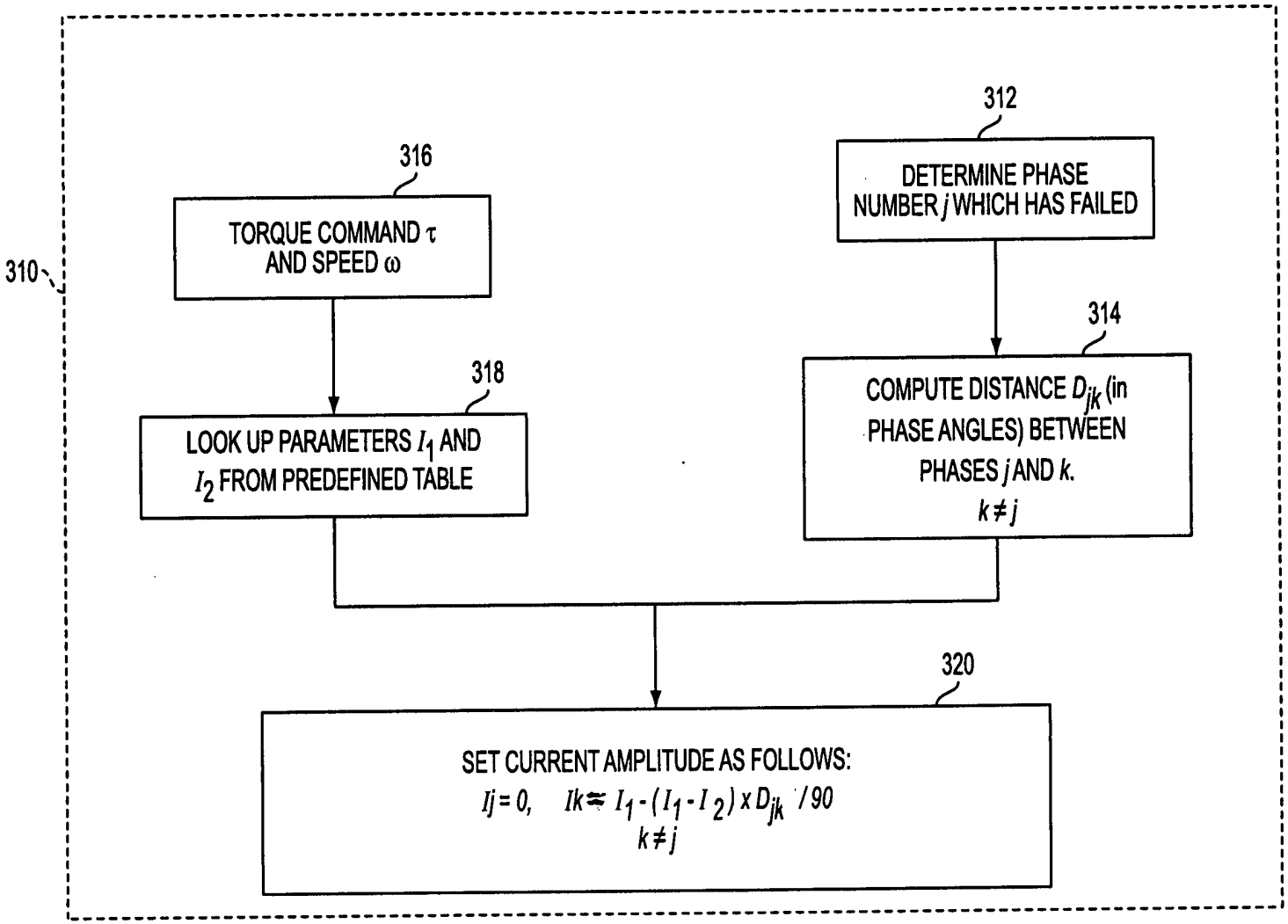
310
312
DETERMINE PHASE NUMBER j WHICH HAS FAILED
316
TORQUE COMMAND τ AND SPEED ω
314
COMPUTE DISTANCE D_{jk} (in PHASE ANGLES) BETWEEN PHASES j AND k. $k \neq j$
318
LOOK UP PARAMETERS I_1 AND I_2 FROM PREDEFINED TABLE
320
SET CURRENT AMPLITUDE AS FOLLOWS:
$Ij = 0, \quad Ik = I_1 - (I_1 - I_2) \times D_{jk} / 90$
$k \neq j$

FIG. 4

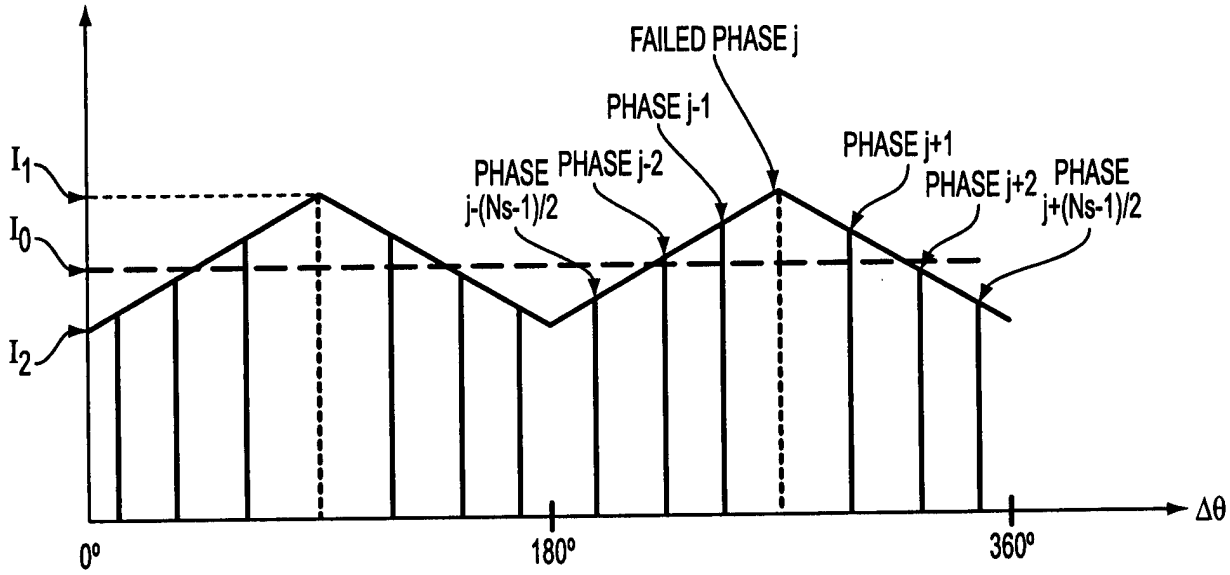
FAILED PHASE j
PHASE j-1
PHASE j+1
PHASE j-2
PHASE j+2
PHASE j-(Ns-1)/2
PHASE j+(Ns-1)/2
I1
I0
I2
0°
180°
360°
Δθ

FIG. 5

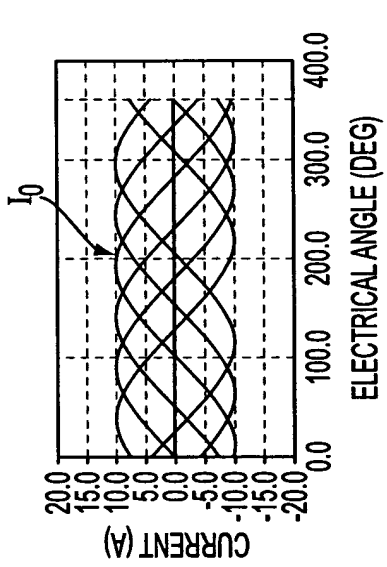
I_0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
CURRENT (A)
0.0
100.0
200.0
300.0
400.0
ELECTRICAL ANGLE (DEG)

FIG. 6A

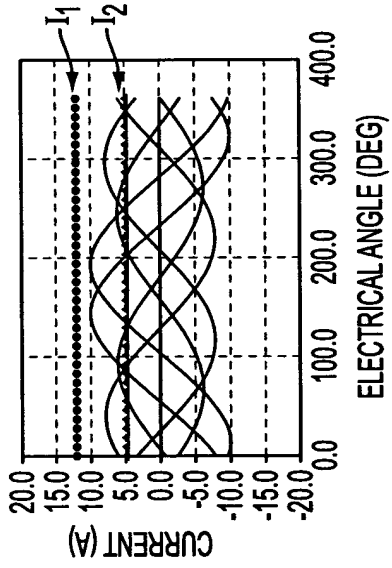
I_1
I_2
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
CURRENT (A)
0.0
100.0
200.0
300.0
400.0
ELECTRICAL ANGLE (DEG)

FIG. 6B

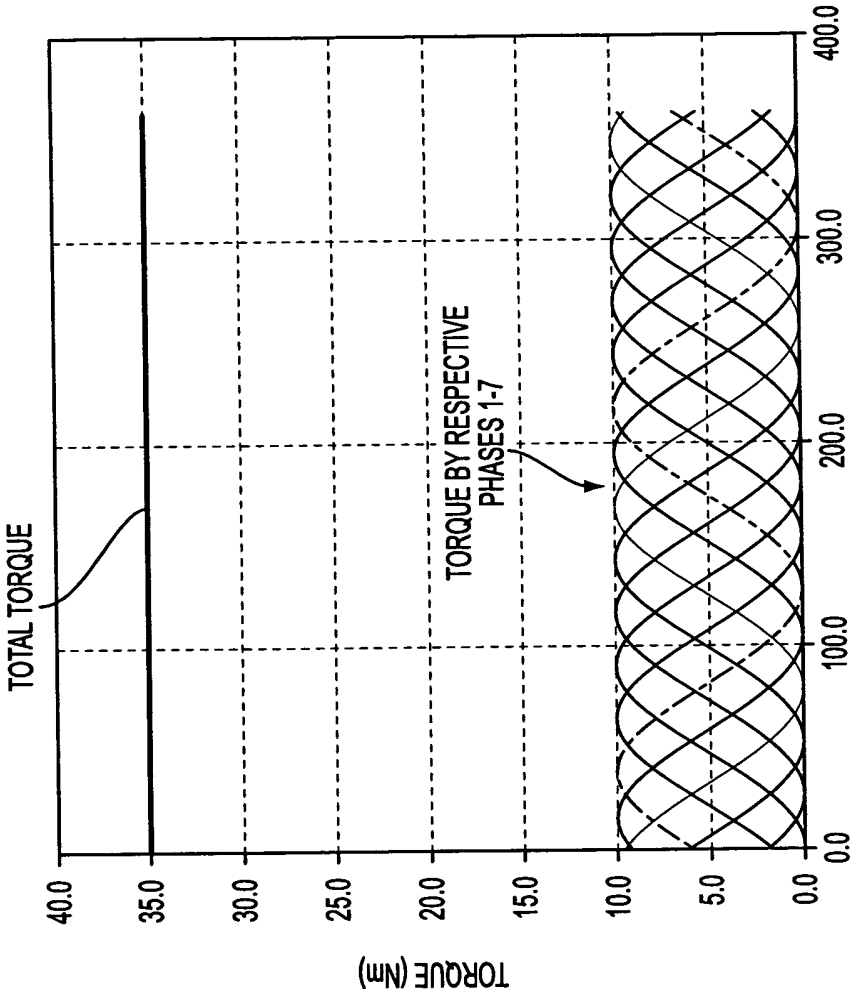
TOTAL TORQUE
TORQUE BY RESPECTIVE PHASES 1-7
TORQUE (Nm)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
100.0
200.0
300.0
400.0
ELECTRICAL ANGLE (DEG)

FIG. 7

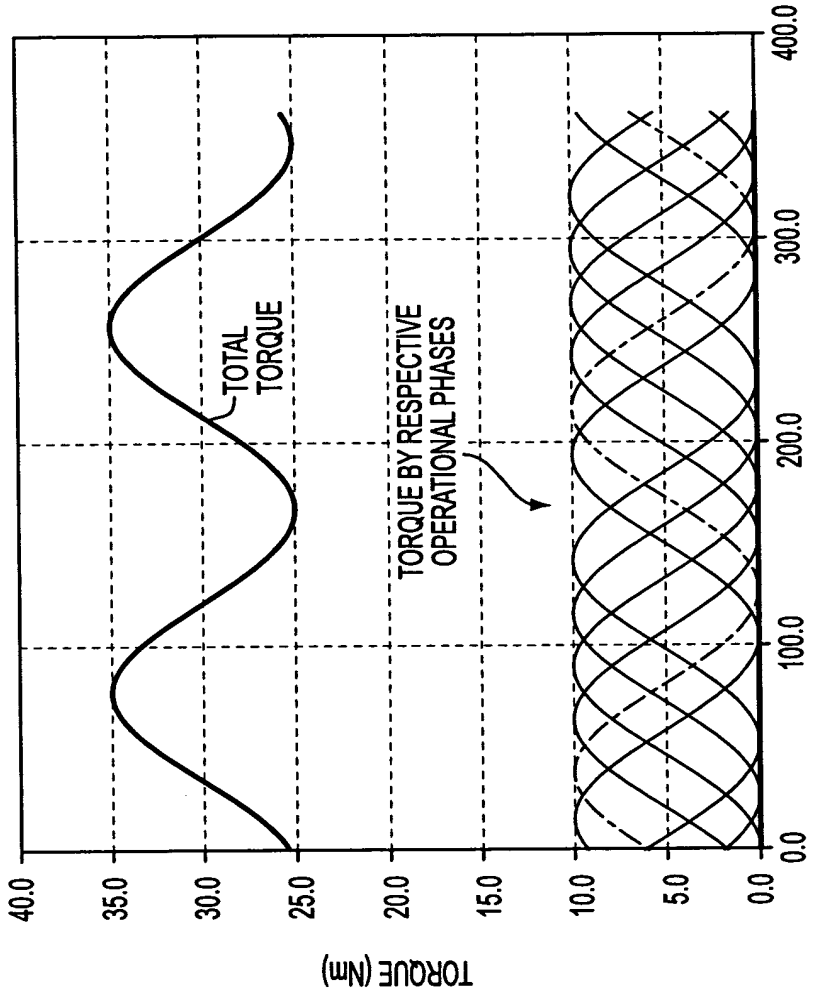
TOTAL TORQUE
TORQUE BY RESPECTIVE OPERATIONAL PHASES
TORQUE (Nm)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
100.0
200.0
300.0
400.0
ELECTRICAL ANGLE (DEG)

FIG. 8

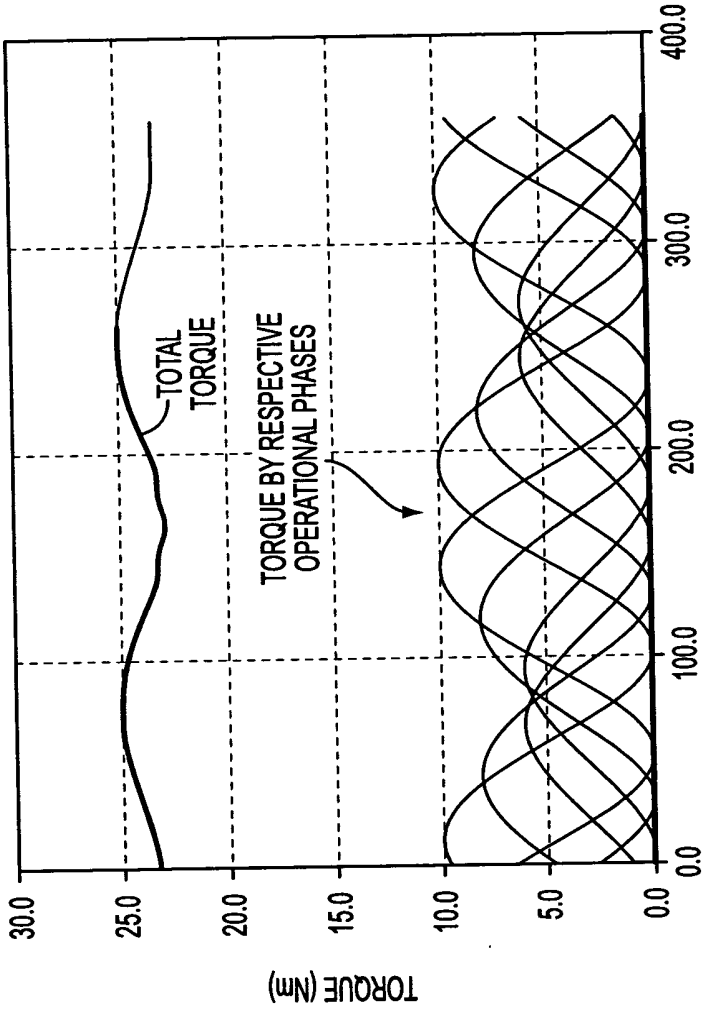
TOTAL TORQUE
TORQUE BY RESPECTIVE OPERATIONAL PHASES
TORQUE (Nm)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
100.0
200.0
300.0
400.0
ELECTRICAL ANGLE (DEG)

FIG. 9